

WHAT IS CLAIMED IS:

1. A toothbrush, comprising:

- a handle;
- a head connected to said handle by a neck element; and
- 5 - a mechanical vibratory device which causes the head to vibrate, said

mechanical vibratory device located in the head or in a region adjacent to the head and
operatively connected to an electric power source,
wherein said head comprises movable elements attached thereto for providing an enhanced
cleaning effect upon vibration of said head by said mechanical vibratory element.

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2. The toothbrush according to claim 1, wherein that the vibratory device comprises a
vibratory element driven by a drive which can be electrically connected to the power
source and is arranged directly adjacent to the vibratory element in the head part or in the
region adjacent to the head part.

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3. The toothbrush according to claim 2, wherein the vibratory device comprises a vibratory
element designed in the manner of a vibratory armature, can be electrically connected
directly to the power source and, with the power source connected, is made to vibrate.

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4. The toothbrush according to claim 2, wherein that the vibratory element is designed as
an eccentric which is mounted in a housing such that it can be rotated about an axis
located in the longitudinal direction of the toothbrush.

5. The toothbrush according to claim 1, further comprising a vibration-damping element to
25 prevent or minimize vibration transmission to the handle.

6. The toothbrush according to claim 5, wherein the neck part has vibration-damping neck-part zones made of an elastically compliant material and located in region between the vibratory element and the handle.

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7. The toothbrush according to claim 2, wherein the power source is an exchangeable battery which can be inserted into the handle and can be electrically connected directly to the drive or to the vibratory element.

10 8. The toothbrush according to claim 7, wherein that the battery can be inserted into a sleeve which is made of electrically conductive material and is arranged in a handle cavity which is open to the rear and can be closed from the rear by a closure part.

15 9. The toothbrush according to claim 1, wherein the head has a retaining element on which a bristle carrier is provided with bristles positioned in an exchangeable manner.

10. The toothbrush according to claim 1, wherein the head part is arranged such that it can be moved in relation to the neck part, and can be made to move relative to the neck part by the vibrations produced by the vibratory device.

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11. The toothbrush according to claim 1, wherein the vibratory device and electronic components form a unit which is capable of being positioned in an injection molding made of a first material component and being at least partially encapsulated in at least one further material component by injection molding.

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12. The toothbrush according to claim 1, wherein the vibratory device and electronic components form a unit which is capable of being accommodated between two separately produced toothbrush parts which are connected to one another in a water-tight manner.

5 13. The toothbrush according to claim 1, wherein the head comprises a body portion and a plurality of separate cleaning areas, at least one of said cleaning areas comprising a base with at least one outwardly extending cleaning element, at least one of said cleaning areas being a pod having at least one outwardly extending cleaning element, said pod having a greater degree of movability than said base, and said pod being resilient whereby said at
10 least one cleaning element of said pod is movable from an initial position and being returnable to said initial position.

14. The toothbrush according to claim 1, wherein the head comprises a movable portion and a fixed portion surrounding the movable portion, cleaning elements mounted in the
15 fixed and movable portions, a resilient membrane extending between at least a portion of the area between the fixed and movable portions and the membrane being capable of flexing to alter its original orientation during use of said toothbrush and then recovering to assume its original orientation randomly during use of said toothbrush.

20 15. The toothbrush according to claim 1, wherein the head comprises a base having an upstanding wall to create an area for attachment of a resilient membrane mounted to the frame, at least one cleaning element on the membrane extending away from the head, and the membrane being capable of flexing to alter its original orientation during use of said toothbrush and then recovering to assume its original orientation randomly during use of
25 said toothbrush.

16. A toothbrush, comprising:

- a handle;
- a head connected to said handle by a neck element; and
- 5 - a mechanical vibratory device which causes the head to vibrate, said

mechanical vibratory device located in the head or in a region adjacent to the head and operatively connected to an electric power source,

wherein said head comprises a body portion and a plurality of separate cleaning areas, at least one of said cleaning areas comprising a base with at least one outwardly extending

10 cleaning element, at least one of said cleaning areas being a pod having at least one outwardly extending cleaning element, said pod having a greater degree of movability than said base, and said pod being resilient whereby said at least one cleaning element of said pod is movable from an initial position and being returnable to said initial position.

15 17. The toothbrush according to claim 16, wherein said at least one cleaning element of said pod is capable of 360 degrees rotation about the vertical axis of said pod.

18. The toothbrush according to claim 16, wherein said pod includes an intermediate longitudinal portion of reduced diameter.

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19. The toothbrush according to claim 16, wherein said pod is formed by a thin diameter beam enclosed in elastic material.

20. The toothbrush according to claim 16, wherein said beam extends from said body
25 portion of said head to a thin pad to which said at least one cleaning element is mounted.

21. The toothbrush according to claim 16, wherein said at least one cleaning element mounted to said pad comprises a plurality of bristles.

5 22. The toothbrush according to claim 16, wherein said cleaning areas include a plurality of said pods.

23. The toothbrush according to claim 22, wherein there are a plurality of said areas each having a base.

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24. The toothbrush according to claim 23, wherein one of said areas having a base is located at the distal end of said head and another of said areas having a base located at the proximal end of said head, and said pods being between said distal base and said proximal base.

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25. The toothbrush according to claim 24, wherein said bases and said pods are longitudinally aligned.

26. The toothbrush according to claim 25, wherein said cleaning areas are separated
20 from each other by transverse channels extending across said head.

27. The toothbrush according to claim 26, wherein each of said bases and each of said pods has a generally oval outer surface.

28. The toothbrush according to claim 27, wherein said pods have a larger outer surface than said outer surface of said bases.

29. The toothbrush according to claim 21, wherein said cleaning elements of said bases and said cleaning elements of said pods are a plurality of bristles on each of said bases and on each of said pods.

30. The toothbrush according to claim 16, wherein each of said bases is non-movable.

31. The toothbrush according to claim 16, wherein said cleaning areas are separated from each other by a transverse channel extending across said head.

32. The toothbrush according to claim 16, wherein said cleaning areas include two adjacent pods, and said pods including a continuous layer of elastic material covering both of said pods.

33. The toothbrush of claim 16, wherein there is a base at each longitudinal end of said head, and two of said pods being longitudinally between and aligned with said bases.

34. The toothbrush according to claim 21, wherein said cleaning elements on said bases have terminal ends which taper outwardly toward the longitudinal center of said head, said cleaning elements of said pods having terminal ends which taper outwardly away from said longitudinal center of said head, and each adjacent pair of base and pod having their cleaning elements with the longest portions adjacent to each other.

35. The toothbrush according to claim 21, wherein said cleaning elements on said bases have terminal ends and said cleaning elements on said pods have terminal ends, and said terminal ends of all of said cleaning elements jointly having a concave shape.

5 36. The toothbrush according to claim 16, wherein said cleaning areas include a plurality of said pods, each of said pods having a narrow stem made of an elastic material and a thin pad extending across and outwardly of said stem with said cleaning elements extending outwardly from said thin pad to create a mushroom shape, and said pods being interconnected by a support interconnecting said stems.

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37. The toothbrush according to claim 36, wherein said interconnected pods form a unitary subassembly secured to the remaining portion of said head.

15 38. The toothbrush according to claim 16, wherein said cleaning elements are bristles joined to said thin pad by an IMT process, said remainder of said head being formed integrally with said handle, and said subassembly being molded to said remainder of said head.

20 39. A method of forming a toothbrush, comprising:
- a handle;
- a head connected to said handle by a neck element; and
- a mechanical vibratory device which causes the head to vibrate, said mechanical vibratory device located in the head or in a region adjacent to the head and operatively connected to an electric power source,

wherein said head comprises a rigid body portion, a plurality of spaced pods extending outwardly from said body portion, each of said pods including a narrow resilient stem capable of moving from an initial position and being returnable to said initial position, a plate mounted to and across each of said stems, a plurality of cleaning elements mounted to and extending outwardly from each of said plates, and said stems being connected to each other by a support secured to said body portion.

40. A method of forming a toothbrush comprising:

- a handle;
- 10 - a cleaning head connected to said handle by a neck element; and

a mechanical vibratory device which causes the head to vibrate, said mechanical vibratory device located in the head or in a region adjacent to the head and operatively connected to an electric power source,

comprising the steps of forming a unitary subassembly by molding a plurality of spaced

15 pods wherein each of the pods has a thin elastic stem and an outwardly extending plate with a plurality of bristles extending outwardly from the plate and secured to the plate by an IMT procedure and wherein the spaced pods are interconnected to each other by a support integral with each of the stems to create the subassembly, providing a second subassembly from the handle and a portion of the cleaning head, and securing the unitary

20 subassembly to the portion of the cleaning head to complete the cleaning head structure by the mounting of the unitary subassembly to the portion of the cleaning head.

41. The method according to claim 40, wherein the unitary subassembly is secured to the second subassembly by an injection molding process during the molding of the second

25 subassembly.

42. The method according to claim 40, wherein the second subassembly includes a distal base portion located longitudinally on one side of the unitary subassembly distal from the handle and includes a proximal base portion located on an opposite side of the unitary subassembly proximate to the handle, and mounting cleaning elements to each of the distal and proximal base portions.

43. The method according to claim 42, wherein the unitary subassembly is formed with at least three spaced pods.

44. The method according to claim 40, wherein the plate and the stem of each pod and the interconnecting support are made of a blend of polypropylene and soft TPE.

45. A toothbrush, comprising:

- a handle;
- a head connected to said handle by a neck element; and
- a mechanical vibratory device which causes the head to vibrate, said

mechanical vibratory device located in the head or in a region adjacent to the head and

operatively connected to an electric power source,

wherein said head comprises a movable portion and a fixed portion surrounding the

movable portion, cleaning elements mounted in the fixed and movable portions, a resilient

membrane extending between at least a portion of the area between the fixed and movable

portions and the membrane being capable of flexing to alter its original orientation during

use of said toothbrush and then recovering to assume its original orientation randomly during use of said toothbrush.

46. The toothbrush according to claim 45, wherein said at least one cleaning element
5 comprises bristles secured to the membrane by in-molded technology.

47. The toothbrush according to claim 45, wherein at least one additional cleaning element is included in an area between the fixed and movable portions of the head.

10 48. The toothbrush according to claim 47, wherein the additional cleaning elements comprise movable wipers.

49. The toothbrush according to claim 48, wherein the movable wipers are mounted on the resilient membrane and rotate towards one another upon application of sufficient force
15 on the toothbrush and away from each other upon release of that force.

50. A toothbrush, comprising:

- a handle;
- a head connected to said handle by a neck element; and
- 20 - a mechanical vibratory device which causes the head to vibrate, said mechanical vibratory device located in the head or in a region adjacent to the head and operatively connected to an electric power source,
wherein said head is flexibly mounted to the handle, the head having an upper face with fingers flexibly mounted, thereon, and ribs connecting the fingers to the upper face

whereby flexure of the head or its upper face causes lateral movement of the fingers relative to the longitudinal axis of the toothbrush.

51. The toothbrush according to claim 50, wherein at least a portion of fingers comprise a soft elastomeric material..

52. The toothbrush according to claim 51, wherein the composition of the rib material is stiffer than the elastomeric material of the fingers.

53. The toothbrush according to claim 50, wherein the fingers are mounted in openings in the flexible face of the head.

54. The toothbrush according to claim 50, wherein the ribs interconnecting the fingers and flexible face are formed from polypropylene.

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55. The toothbrush according to claim 50, wherein multiple fingers are interconnected by ribs on one side of the fingers whereby all fingers connected by the ribs move in one direction when the head is flexed.

56. The toothbrush according to claim 50, wherein multiple fingers are interconnected by ribs on opposite sides of the fingers whereby the fingers move in opposite directions when the head is flexed.

57. The toothbrush according to claim 50, wherein the head contains fingers along at least one edge of the head and cleaning elements are at least another portion of the head.

58. The toothbrush according to claim 57, wherein the cleaning elements are moved by a powered source in the toothbrush.

59. A toothbrush, comprising:

- 5 - a handle;
- a head connected to said handle by a neck element, said head comprising an outer perimeter portion formed of a rigid material, said rigid material being adapted to allow said head to be sonically welded;
- a tuft field positioned within said outer perimeter portion and being formed
- 10 of a flexible elastomer, said tuft field defining one or more apertures to receive one or more bristle tufts, said head being sonically welded into place in said toothbrush; and
- a mechanical vibratory device which causes the head to vibrate, said mechanical vibratory device located in the head or in a region adjacent to the head and operatively connected to an electric power source.

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60. The toothbrush according to claim 59, wherein said rigid material comprises polypropylene.

61. The toothbrush according to claim 59, wherein said flexible elastomer has a

20 hardness of 90 shore A or less.

62. The toothbrush according to claim 59, wherein during normal brushing conditions both said tuft field and said one or more bristle tufts move.

63. The toothbrush according to claim 59, wherein said tuft field flexes during normal brushing conditions.

64. The toothbrush according to claim 59, wherein said tuft field flexes upon the application of pressure thereto.

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65. The toothbrush according to claim 59, wherein said one or more bristle tufts are secured within each corresponding aperture in said tuft field by melting a portion of the bristles forming each of said bristle tufts.

10 66. The toothbrush according to claim 59, wherein said bristle tufts are melted adjacent a back surface of said tuft field that is to be positioned facing said toothbrush.

67. A method for forming a head for use with the toothbrush according to claim 59, comprising the steps of:

15 forming an outer perimeter portion of a rigid material, said rigid material being adapted to allow said head to be sonically welded; and

positioning a tuft field within said outer perimeter portion, said tuft field being formed of a flexible elastomer, said tuft field defining one or more apertures to receive one or more bristle tufts;

20 placing a bristle tuft within at least one corresponding aperture in said tuft field; melting a portion of bristles in said bristle tuft to secure said bristle tuft in said aperture in said tuft field; and

sonically welding said tuft field into place in said toothbrush.

68. The method according to claim 67, wherein said rigid material comprises polypropylene.

69. The method according to claim 67, wherein said flexible elastomer has a hardness
5 of 90 shore A or less.

70. The method according to claim 67, wherein during normal brushing conditions both said tuft field and said one or more bristle tufts move.

10 71. The method according to claim 67, wherein during normal brushing conditions said tuft field flexes.

72. The method according to claim 67, wherein said tuft field flexes upon the application of pressure thereto.

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73. The method according to claim 67, further comprising the step of securing said one or more bristle tufts within each corresponding aperture in said tuft field by melting a portion of the bristles forming each of said bristle tufts.

20 74. The method according to claim 73, wherein said bristle tufts are melted adjacent a back surface of said tuft field that is to be positioned facing said toothbrush.